poles of a series of circles of equal acceleration and retardation, of equal value therefore for applying Delisle's method. Moreover, these circles manifestly indicate a value proportional directly to their distance from the plane of the great circle having the before-mentioned points as poles. The intersections of these circles indicate points of a particular value for Halley's method, the excess or defect of duration being (i) the sum of the corresponding accelerations or retardations where each of two intersecting circles indicates a time difference of the same kind, or (ii) the excess of acceleration over retardation, or of retardation over acceleration where the time differences are of different kinds. It is readily seen that if points of equal value for Halley's method are connected, the connecting curves are a series of circles, having as poles the points midway between the poles of maximum retardation and those of maximum acceleration. Moreover, these circles, like those of equal value for Delisle's method, indicate values directly proportional to their distance from the plane of the great circle having these mid-points as poles.

In my chart the several curves corresponding to these circles have been drawn; but *all the corrections depending on the Earth's rotation during ingress and egress, and on the curvature of the shadow-cone, have been carefully taken into account.*

The dotted red* curves are those indicating the *loci* of points of equal value for Delisle's method, and the red curves indicate the *loci* of points of equal value for Halley's method. The actual accelerations or retardations in minutes, and the differences of duration, have been indicated in red letters.

The interpretation of the chart, and the regions indicated as suitable for the various methods proposed to be employed, will be manifest even on a very slight inspection of the chart.

Note upon the Figure and Diameter of Venus.

By John J. Plummer, Esq.

(*Communicated by the Rev. Professor Farrar, D.D.*)

The transit of *Venus* across the Sun's disk affords, as is perfectly well known, the best opportunity for determining the ellipticity of figure of that planet, and it has been very often looked forward to, in order to settle this question as well as the more

* As a rule, I prefer to have only one printing in a chart of this sort, where every line has been laid down with scrupulous accuracy, because the coloured lines may not be printed quite correctly. But in the present case, the map would have been overcrowded by black lines, unless red had been used. To learn the amount of error in 'registering,' it is only necessary to compare the red and black impressions of the small cross lines indicating the points of maximum acceleration and retardation.

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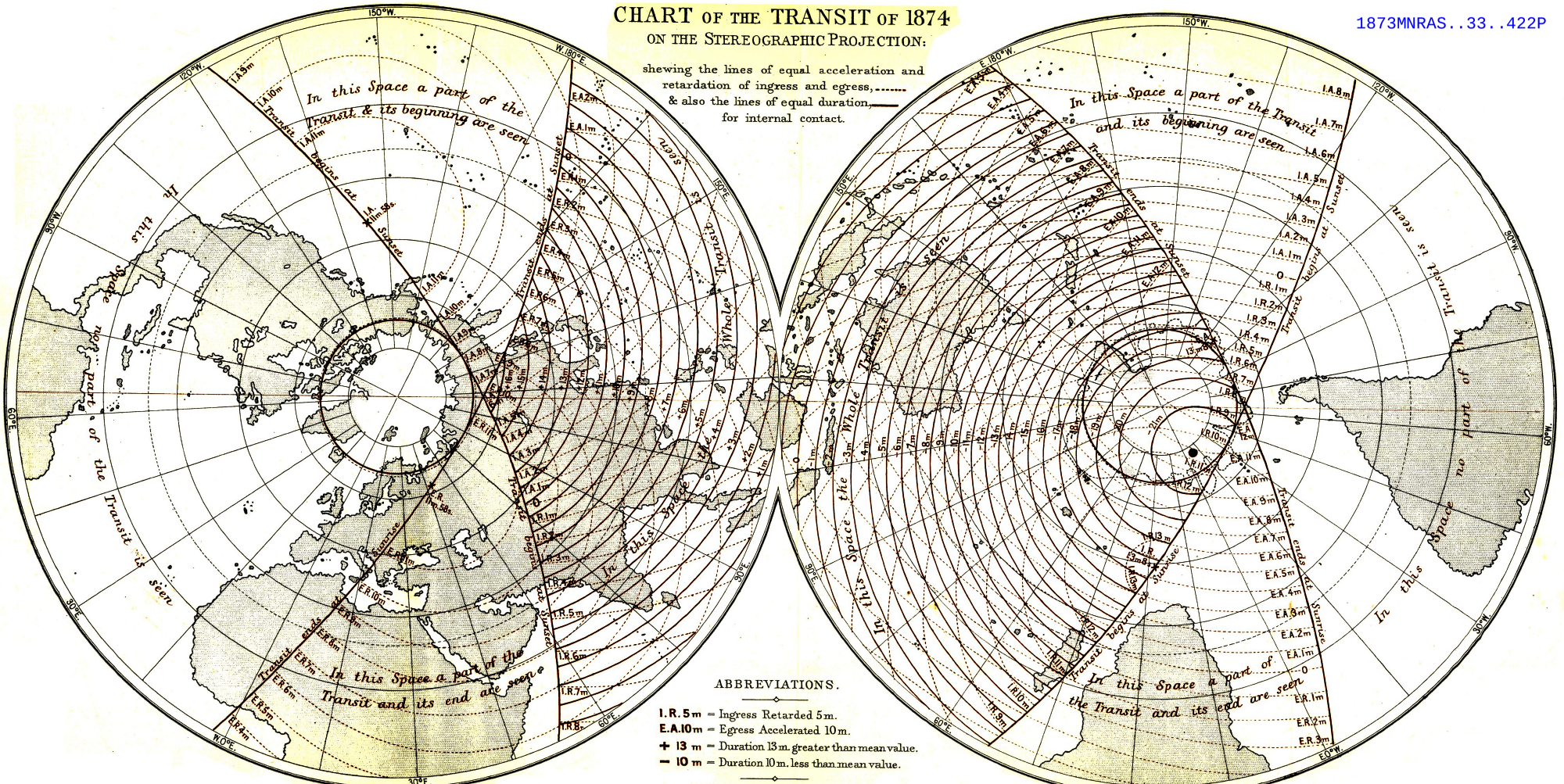
CHART OF THE TRANSIT OF 1874

ON THE STEREOGRAPHIC PROJECTION:

shewing the lines of equal acceleration and retardation of ingress and egress,------ & also the lines of equal duration,—— for internal contact.



ABBREVIATIONS.

I.R. 5m = Ingress Retarded 5m.
E.A.10m = Egress Accelerated 10m.
+ 13 m = Duration 13m. greater than mean value.
− 10 m = Duration 10m. less than mean value.

R. A. PROCTOR, DEL., MAY 1873.

Malby & Sons, lith.

important one of the solar parallax, for which such extensive preparations are in progress. It will be thought, perhaps, that the minor problem may fairly be left to the observation of any astronomer possessed of the requisite means for solving it satisfactorily, but it may not be out of place to draw attention to the fact thus early, as some preparation is necessary even in this matter. Since it is not at all probable that the ellipticity to be determined is considerable, the observation will be a delicate one, and will be best undertaken by the larger instruments of the fixed observatories: the five expeditions, which are to be sent out, should certainly be relieved of the task and of the responsibility. There are unquestionably a sufficient number of English observatories situated in that portion of the globe from which the transit will be visible, but it is doubtful whether they are furnished with the best means of measuring planetary diameters. None, I believe, have large heliometers, and it would be impossible now to provide them with such, but Airy's double-image micrometer would probably give us reliable results, and could be readily supplied to those observatories at present without this most useful and accurate instrument. It should be employed with the greatest available aperture, especially as there is now no difficulty in finding a variety of means for reducing the intensity of the solar light and heat. But whatever plan was adopted for this purpose, the irradiation correction would be proportionally diminished, and most trustworthy measures of the real dimensions of the planet arrived at, apart from the values of the diameter which the times of transit across the limbs of the Sun will yield.

The probable minuteness of the ellipticity would further render it necessary to have the position of the planet's equator computed beforehand, and hitherto this has not been given in any ephemeris. As far as our present knowledge of this element goes, there is really no evidence that the ellipticity of the disk of *Venus* may not be as great as that of *Mars* or *Mercury*, when it would possibly effect the determination of the amount of the solar parallax, and though this is unlikely, it can only be necessary to call attention to the question for it to be thoroughly arranged for and investigated. My excuse must be, that it seemed liable to be overlooked or forgotten amid the din of preparation for the much more important parallax observations.

I have long been of opinion that the diameter of *Venus* used in the *Nautical Almanac* (viz. 16″·61 at the unit of distance), and which is the value determined by Encke from the transit of 1791, is too small. In 1868 I made a series of measures with the double-image micrometer for the purpose of shedding some light upon this point. These measures have never been published in consequence of their indicating a considerably larger co-efficient for irradiation than the similar observations of Mr. Main, in the *Mem. Roy. Ast. Soc.* vol. xxv. p. 46, but I am now engaged in repeating the observations with greater care and precaution, and hope to publish the results shortly. As far as these are at present

obtained, they appear to confirm the previous measures. The diameter found from twenty-eight observations, each consisting of twelve contacts, and made upon separate days between the dates March 19th and June 20th, 1868, was 17·695 at the mean distance of the Earth from the Sun; and though I cannot place much weight upon the result, as being my first essay with the double-image micrometer, it only slightly exceeds Mr. Main's final determination. As there seems, therefore, some reason to doubt whether even the diameter found by Mr. Stone from the Greenwich meridian observations (16″·944), to which Mr. Dunkin refers in the last number of the *Monthly Notices*, is large enough, I trust the measurements upon which I am engaged may have a special interest at the present conjuncture.

Durham Observatory, April 24th, 1873.

Observations of the Planet Venus in 1873. By T. G. Elger, Esq.

I beg to lay before the Society the following observations of the planet *Venus* made during the last three months with an achromatic of 4-inch aperture by Cooke.

Whenever the weather permitted, I observed the planet a few hours before sunset, as I always find that the markings on the disk, and the form of the terminator are seen to much greater advantage in broad daylight than at night.

The twenty-five drawings which accompany this paper* are "transfers" from sketches made at the telescope.

Jan. 2nd, 1873. 4^h to $4^h\ 30^m$. I noticed a conspicuous marking which extended from the N. limb of the planet through the centre of the illuminated disk; its shape and position are shown in Fig. 1. The S. junction of the terminator with the limb was evidently rounded off, while in the vicinity of the N. limb the terminator was slightly concave. (*a*. Fig. 1.)

At 6^h on the same day, the N. half the terminator formed a perfect "Ogee" curve. (Fig. 2.)

Jan. 3rd. 3^h to 4^h. No irregularities in the shape of the terminator were remarked, except the evident rounding off noticed on the previous day. A faint marking, very similar in shape to that observed at 4^h on January 2nd, was seen. (Fig. 3.)

Jan. 5th. 3^h to $3^h\ 30^m$. An irregular-shaped marking was distinctly visible, in spite of the unfavourable state of the atmosphere. (Fig. 4.)

Jan. 10th. 2^h to $3^h\ 0^m$. The planet was a beautiful telescopic object; its silvery lustre was however somewhat dimmed in places by faint and ill-defined markings. An irregularity in the terminator, near the S. limb, was steadily seen. (*a*. Fig. 5.)

* These drawings were exhibited at the meeting, and can be seen at the Society's rooms.